# 7. WAG 4 ECOLOGICAL RISK ASSESSMENT

The WAG-level assessment is the second phase in the INEEL ecological risk assessment (ERA) process, indicated on detailed on Figure 7-1, and provides a site-by-site evaluation of the potential risks to ecological resources as a result of exposure to radiological and nonradiological contaminants. The assessment was performed using the results of a previously conducted data gap analysisMcCormick et al. 1997 and the same basic methodology developed in the *Guidance Manual for Conducting Screening Level Ecological Risk Assessments at the INEL* (VanHorn et al. 1995), subsequently referred to as the Guidance Manual. The SLERA was conducted to screen sites identified in the FFA/CO (DOE-ID 1991) and to identify those contaminants present at WAG 4 that have the potential to cause undesirable ecological effects. The sites and contaminants identified as a result of that assessment are analyzed here. The results of this assessment will be integrated with similar assessments for other INEEL WAGs to support the performance of the OU 10-04 baseline ERA.

## 7.1 Objectives

The objectives of this ERA are to:

- Determine the potential for adverse effects from contaminants on ecological receptors, including protected wildlife species, at the WAG level
- Identify sites and COPCs to be assessed in the OU 10-04 ERA
- Provide input to the data gap analysis for the OU 10-04 ERA.

This ERA was specifically designed to follow the direction provided by the *Framework for Ecological Risk Assessment* (EPA 1992a) and the more recent guidances (EPA 1997 and EPA 1998). This approach divides the ERA process into three steps: problem formulation, analysis, and risk characterization.

The goal of the problem formulation step of the ERA is to investigate the interactions between the stressor characteristics, the ecosystem potentially at risk, and the ecological effects (EPA 1992a). The problem formulation phase results in characterization of stressors (i.e., identification of the contaminants), definition of assessment and measurement endpoints, and the ecological effects that will be used to analyze risk using the CSM. This step of the assessment is presented in Section 7.2, Problem Formulation.

In the analysis step, the likelihood and significance of an adverse reaction from exposure to the stressor(s) were evaluated. The behavior and fate of the COPCs in the terrestrial environment was presented in a general manner since no formal fate and transport modeling was conducted for this WAG ERA. The ecological effects assessment consisted of hazard evaluation, and dose-response assessment. The hazard evaluation involved a comprehensive review of toxicity data for contaminants to identify the nature and severity of toxic properties. Because no dose-based toxicological criteria exist for ecological receptors, it was necessary to develop appropriate toxicity reference values (TRVs) for the contaminants and functional groups at INEEL. A quantitative analysis was used, augmented by qualitative information and professional judgment as necessary. This step of the assessment is presented in Section 7.3, Analysis.

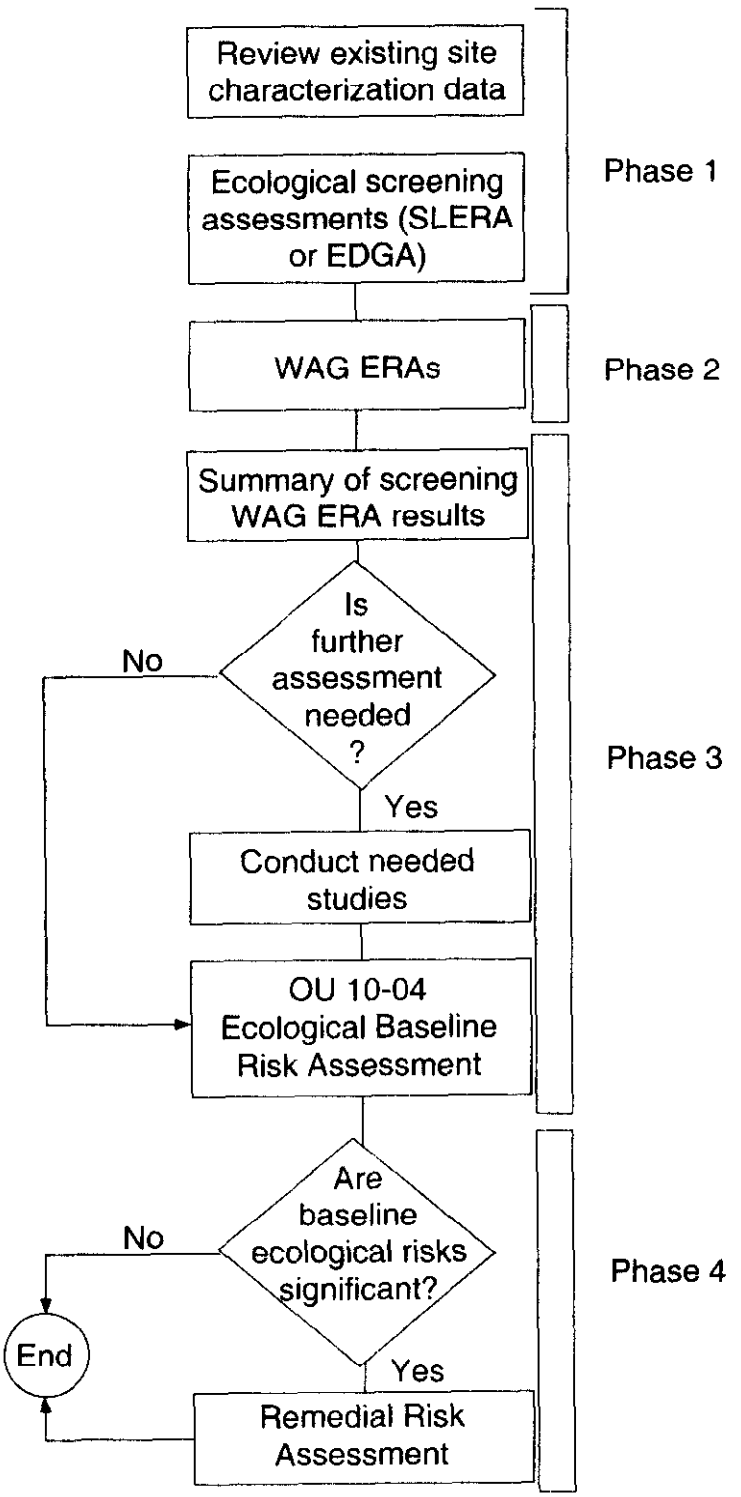


**Figure 7-1.** A phased approach to OU 10-04 ERA.

The risk characterization step has two primary elements (EPA 1992a). The first element is the development of an indication of the likelihood of adverse effects to ecological receptors. The second element is the presentation of the assessment results in a form that serves as input to the risk management process. To determine whether there is any indication of risk due to the contaminant concentrations, exposure parameters were used to calculate dose to key functional groups and individuals species, including threatened and/or endangered (T/E), and other "species of concern" (see Section 7.2.4.3). Hazard quotients (HQs) were then calculated for WAG 4 receptors by dividing the calculated dose by the TRV and were then used as an indicator of potential effects. This step of assessment is presented in Section 7.4, Risk Characterization.

The results of this WAG ERA will be integrated with assessments for other WAGs to support the Operable Unit (OU) 10-04 ERA. The strategy for using the results of the WAG 4 ERA to support the OU 10-04 ERA is discussed in Section 7.5, Transition to OU 10-04 ERA.

### 7.1.1 Statutory and Regulatory Basis

The widespread application of ERAs to hazardous waste site investigations under CERCLA began in December 1988, when the EPA directed that "thorough and consistent" ecological assessments should be performed at all Superfund sites (EPA 1988a). This directive was based on the language in CERCLA [as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and other statutes] mandating remediation of hazardous waste sites to protect the environment as well as human health. The National Contingency Plan requires that baseline risk assessments characterize the current and potential threats to human health and the environment [40 CFR Part 300.430 (d)(4)], and specifies that environmental risk evaluations "assess threats to the environment, especially sensitive habitats and critical habitats of species protected under the Endangered Species Act" [40 CFR Part 300.430(e)(2)(I)(G)].

Section 121(d)(A) of CERCLA requires that Superfund remedial actions meet Federal and State standards, requirements, criteria, or limitations that "are applicable or relevant and appropriate requirements (ARARs)." ARARs are those substantive environmental protection requirements promulgated under Federal or State laws that, while not legally applicable to the circumstances at the site or facility, address situations sufficiently similar so that their use is well suited to the particular site. ARARs applicable to the WAG 4 ERA are listed in Table 7-1. A further discussion of ARARs is included in the Guidance Manual (VanHorn et al. 1995).

**Table 7-1**. ARARs for the WAG 4 ERA.

| Requirement | Authority | Trigger |
|---|---|---|
| Endangered Species Act | 16 USC 1531B1543 | Location specific |
| Threatened Fish and Wildlife | 50 CFR Part 227 | Location specific |
| Endangered Fish and Wildlife | 50 CFR Part 222 | Location specific |
| Migratory Bird Conservation | 16 USC 715 | Location specific |
| Migratory Bird Treaty Act | 16 USC 703 | Location specific |
| Protection of Bald and Golden Eagles Act | 16 USC 668 | Location specific |
| Idaho Fish and Wildlife Act (Preservation of Fishery Resources) | 16 USC 756, 757 | Location specific |
| Wetlands Conservation Act | 16 USC 4404 | Location specific |

Recognizing the need, DOE published *Incorporating Ecological Risk Assessment into Remedial Investigation/Feasibility Study Work Plans* (DOE 1994). "This document provides guidance to the U.S. Department of Energy staff and contractor personnel for incorporation of ecological information into environmental remediation planning and decision making at CERCLA sites." (DOE 1994).

Compliance with ARARs is a threshold requirement that a remedial/restoration activity must meet to be eligible for selection as a remedy. ARARs are either chemical-, action-, or location-specific, depending upon whether the requirement is triggered by the presence or emission of a chemical, by a particular action, or by a vulnerable or protected location. A list of the definitions of these ARARs follows.

- Contaminant-specific—Risk-based numerical values or methodologies that establish an acceptable amount of concentration of a contaminant in the ambient environment
- Action-specific—Technology or activity-based requirements for remedial/restoration actions
- Location-specific—Restrictions placed upon the concentration of hazardous substances or the conduct of activity at a given location.

Only location-specific ARARs are applicable in the WAG 4 ERA.

This WAG 4 ERA addresses issues related to all ARARs (listed in Table 7-1) except the Wetlands Conservation Act. This ARAR is included since, wetland habitat at some WAG facilities has appeared on maps as part of the Fish and Wildlife National Wetlands Inventory (Hampton et al. 1995). At WAG facilities, wetland habitats generally include waste ponds that are generated solely due to facility activities and preliminary surveys indicate that most do not meet formal wetland classification criteria (ACOE 1987). However, if future evaluation indicates that these ponds meet formal designation criteria, they will be evaluated based on ARAR considerations. T/E, and/or other species of concern protected by ARARs, are discussed in Section 7.2.4.

## 7.2 Problem Formulation

The goal of the problem formulation step of the ERA is to investigate the interactions between the stressor characteristics, the ecosystem potentially at risk, and the ecological effects (EPA 1992a). This process begins with a general description of the site (see Section 1 for details) and previous investigations, and a characterization of the ecosystem at risk. Next, the potential stressors to the ecosystem are identified, the migration pathways of the identified stressors are modeled, and the potentially affected components of the ecosystem are identified. The ecosystem at risk and stressor characterization with exposure pathways are then integrated to produce the CSM. The problem formulation step results in characterization of stressors (i.e., identification of the contaminants), definition of assessment endpoints, and the ecological effects that will be used to analyze risk using the CSM. Primary elements of the problem formulation step for the WAG 4 ERA are described in the following sections.

### 7.2.1 Overview of WAG 4

WAG 4 includes hazardous waste release sites at the CFA. CFA is located in the south-central portion of the INEEL approximately 93 km (50 mi) west of the city of Idaho Falls and northwest of the city of Pocatello (see Figure 1-1). The original facilities at CFA were built in the 1940s and 1950s to house Naval Gunnery Range personnel. The facilities have been modified over the years to fit the

changing needs of the INEEL and now provide four major types of functional space: craft, office, service, and laboratory. Approximately 820 people routinely work at CFA.

WAG 4 currently consists of 52 potential release sites divided into 13 OUs. The thirteenth OU is this OU 4-13 Comprehensive WAG 4 RI/FS. The FFA/CO originally included 44 sites in WAG 4. Eight sites were added through the new site identification process. The sites include landfills, spills, ponds, USTs, drywells, and a sewage treatment plant. COPCs include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), radionuclides, petroleum wastes, heavy metals, PCBs, pesticides, and herbicides. Summary human health assessments, Track 1 and Track 2 investigations, and/or an interim action have been completed for all the potential release sites. See Section 4 for an overview of WAG 4.

### 7.2.2 Sites of Concern

WAG 4 sites were initially eliminated from consideration in the WAG 4 data gap analysis (DOE/ID-10550 1997) if the site is uncontaminated (no source to the environment) or if the site is inaccessible to ecological receptors of concern (no pathway to ecological receptors). During the ERA, sites identified at WAG 4 were again reviewed for possible elimination from consideration in this ERA for similar reasons. Table 7-2 includes the justification for eliminating sites from consideration.

The list of sites to be further evaluated in the ERA analysis (i.e., the sites of concern) are presented in Table 7-3. This table lists the contaminants identified at each site, and provides a brief description and size of each site. Figure 7-2 illustrates the location of individual sites of potential concern in relation to CFA.

More complete descriptions of the sites of concern for both human and ecological health are presented as part of the human health assessment (see Section 6). Additionally, several sites that have been previously eliminated as a human health risk were assessed for ecological receptors. These sites were eliminated from further consideration under the human health pathway during either the Track 1 or 2 process. The sites typically did not pose a significant risk to human health but did indicate some contamination existed. Since the decision to include or not include sites for the human health risk assessment does not address ecological risks, these sites are retained for assessment here. These sites, which were retained for assessment in the WAG ERA, are described below.

**CFA-01**—Landfill I is located approximately 0.8 km (0.5 mi) northwest of CFA proper and covers approximately 3.3 ha (8.25 acres). From the early 1950s to 1984 wastes such as construction debris, paper, cafeteria garbage, and other solid and liquid wastes typically found in municipal landfills were disposed in Landfill I. Potentially hazardous wastes were also disposed to the landfill such as paint, resins, sludge, and chemicals. A Track 2 Investigation was performed at this site in 1992. A recommendation was made in the Track 2 to further evaluate the groundwater and air pathways of Landfill I as part of the OU 4-12 RI/FS (Keck et al. 1994).

**CFA-02**—Landfill II is located northeast of CFA, specifically in the southwest corner of an abandoned gravel pit, and covers approximately 6 ha (15 acres). The gravel pit opened in the early 1950s, and waste disposal began in September 1970 in the southwest corner of the pit. The landfill was used from 1970 until 1982 to dispose of wastes such as construction debris, paper, cafeteria garbage and other solid and liquid wastes typically found in municipal landfills. Although not specifically designated for disposal of liquids, some waste oils, solvents and various chemicals were also disposed to the landfill. After landfill operations ceased, overburden material previously stockpiled during the opening of the pit was used for cover material.

**Table 7-2.** WAG 4 OU and site descriptions.

| OU | Site code | Sites description | Track[a] | In[b] | Justification |
|---|---|---|---|---|---|
| 4-01 | CFA-09 | Central Gravel Pit | IA | | No evidence of ordnance at the site; no source. |
| | CFA-11 | French Drain (containing 5-in. shell) N. of CFA-633 | IA | | No evidence of ordnance at the site; no source. |
| 4-02 | CFA-13 | Dry Well (South of CFA-640) | T1 | X | Removal action in 1997; source removed. Confirmation sampling needs to be assessed. |
| | CFA-14 | Two Dry Wells (CFA-665) | T1 | | No evidence of hazardous constituents disposed at the site; drywells not located; no source. |
| | CFA-15 | Dry Well (CFA-674) | T1 | X | Removal action in 1997; source removed. Confirmation sampling needs to be assessed. |
| | CFA-16 | Dry Well (South of CFA-682 Pumphouse) | T1 | | No evidence of hazardous constituents disposed at the site; no source. |
| 4-03 | CFA-18 | Fire Department Training Area, Oil Storage Tank | T1 | | No contamination detected at the site: no source. |
| | CFA-19 | Gasoline Tanks (2) East of CFA-606 | T1 | | No contamination detected at the site: no source. |
| | CFA-20 | Fuel Oil Tank at CFA-609 (CFA-732) | T1 | | No contamination detected at the site: no source. |
| | CFA-21 | Fuel Tank at Nevada Circle 1 (South by CFA-629) | T1 | X | Tank removed in 1991; 5 samples from 7.6 ft contained a maximum of 54,000 mg/kg TPH. |
| | CFA-22 | Fuel Oil Tank at CFA-640 | T1/T2 | | Contaminated soil is present below 3 m (10 ft); no exposure pathway. |
| | CFA-23 | Fuel Oil Tank at CFA-641 | T1 | X | Tank removed in 1990; 12 samples from 6 ft contained 0.009 ppm toluene & 100 ppm TPH. |
| | CFA-24 | Fuel Tank at Nevada Circle 2 (South by CFA-629) | T1 | X | Tank removed in 1991; 6 samples from 7.6 ft contained 26 ppm TPH. |
| | CFA-25 | Fuel Oil Tank at CFA-656 (North side) | T1 | X | Tank removed in 1990; samples contained 20 ppm TPH. |
| | CFA-27 | Fuel Oil Tank at CFA-669 | T1 | X | Tank removed in 1990; samples from 9 ft contained 0.006 ppm toluene, 0.05 ppm ethylbenzene, 0.1 ppm xylenes & 1,100 ppm TPH. |
| | CFA-28 | Fuel Oil Tank at CFA-674 (West) | T1 | X | Tank removed in 1992; samples contained 57.4 mg/kg TPH. |
| | CFA-29 | Fuel Oil Tank at CFA-664 | T1 | X | Tank removed in 1990; samples contained 290 mg/kg TPH. |
| | CFA-30 | Fuel Oil Tank at CFA-665 | T1 | X | Tank removed in 1989; samples from 9 ft contained 76 mg/kg TPH. |
| | CFA-31 | Waste Oil Tank at CFA-754 | T1 | X | Tank removed in 1992; samples contained 5,610 mg/kg. |
| | CFA-32 | Fuel Oil Tank at CFA-667 (North) | T1 | X | Tank removed in 1990; samples contained 30 mg/kg TPH. |
| | CFA-33 | Fuel Oil Tank at CFA-667 (South) | T1 | | Tank removed in 1990; no contamination detected at the site; no source. |
| | CFA-34 | Diesel Tank at CFA-674 (South) | T1 | X | Tank removed in 1990; 5 samples from 8 ft contained 30–290 mg/kg TPH. |
| | CFA-35 | Sulfuric Acid Tank at CFA-674 (West) | T1 | | Tank removed in 1989; tank in good condition with no indication of leakage, no source. |
| | CFA-36 | Gasoline Tank at CFA-680 | T1 | | Tank removed in 1990; no contamination detected at the site; no source. |
| | CFA-37 | Diesel Tank at CFA-681 (South) | T1 | X | Tank removed in 1990; samples from 9 ft contained 180 mg/kg TPH. |
| | CFA-38 | Fuel Oil Tank at CFA-683 | T1 | X | Tank removed in 1992; samples contained 427 mg/kg TPH. |
| | CFA-45[c] | Fuel Oil Tank (CFA-605W) | T1/T2 | X | Tank removed in 1991; T1 samples from 19.5 ft contained 0.1 mg/kg benzene, 0.23 toluene, 1.0 mg/kg ethylbenzene, 2.6 mg/kg xylenes and 9,020 mg/kg TPH. During the T2, 2 surface screening samples indicated TPH <40 mg/kg and between 40 and 1,000 mg/kg. No further sampling was performed. |
| 4-04 | CFA-39 | Drum Dock (CFA-771) | T1 | | Site used to store gas cylinders; no evidence of release of hazardous constituents; site is currently covered with asphalt. No exposure pathway to ecological receptors. |

**Table 7-2.** (continued).

| OU | Site code | Sites description | Track[a] | In[b] | Justification |
|---|---|---|---|---|---|
| | CFA-40 | Returnable Drum StorageXSouth of CFA-601 | T1 | X | 7 of 9 test kit samples collected in 1995 contained <625 ppm TPH and ~2 mg/kg toluene. |
| | CFA-41 | Excess Drum Storage (South of CFA-674) | T1 | X | Samples collected in 1995 contained <625 mg/kg TPH and 2 mg/kg toluene. |
| 4-05 | CFA-04 | Pond Near CFA-674 | T2 | X | Site contains a maximum of 362 mg/kg Hg. |
| | CFA-17/47 | Fire Department Training Area, bermed and Fire Station Chemical Disposal[c,d] | T2 | X | Removal action in 1997. Contamination from metals was assumed to be removed since PAHs, SVOCs and VOCs did not remain. |
| | CFA-50 | Shallow Well East of CFA-654 | T1/T2 | X | Well removed in 1994; confirmation samples indicated minor levels of contamination. |
| 4-06 | CFA-06 | Lead Shop (outside areas) | T2 | X | Removal action in 1996. Arsenic and lead remain. |
| | CFA-43 | Lead Storage Area | T2 | X | Removal action in 1996; confirmation samples indicated minor levels of contamination. |
| | CFA-44 | Spray Paint Booth Drain (CFA-654) | T2 | X | Removal action in 1996; confirmation samples indicated minor levels of contamination. |
| 4-07 | CFA-07 | French Drain E/S (CFA-633) | T1 | | Contaminated soil is present below 10 ft; no exposure pathway to ecological receptors. |
| | CFA-12 | Two French Drains (CFA-690) | T2 | X | Removal action in 1995; confirmation samples indicated minor levels of contamination. |
| | CFA-48[d] | Chemical Washout Area South of CFA-633 | T2 | X | Site partially covered with asphalt; subsurface contamination. |
| 4-08 | CFA-08 | Sewage Plant (CFA-691), Septic Tank (CFA-716), and Drainfield | T2 | X | Contamination remains at this site. |
| | CFA-49[d] | Hot Laundry Drain Pipe | T2 | | Contamination remains below 10 ft. |
| 4-09 | CFA-10 | Transformer Yard Oil Spills | T2 | X | Contamination remains at this site. |
| | CFA-26 | CFA-760 Pump Station Fuel Spill | T2 | X | Above ground tank removed; contamination remains at this site. |
| | CFA-42 | Tank Farm Pump Station Spills | T2 | | Removal action in 1997; confirmation samples indicated minor levels of contamination below 10 ft: no exposure pathway to ecological receptors. |
| | CFA-46[d] | Cafeteria Oil Tank Spill (CFA-721) | T1/T2 | | Contaminated soil is present below 10 ft; no exposure pathway to ecological receptors. |
| 4-10 | CFA-01 | Landfill I | T1/RI | | See OU 4-12 |
| 4-11 | CFA-05 | Motor Pool Pond | RI | X | No action Record of Decision in 1992. |
| 4-12 | CFA-01 | Landfill I | RI | X | OU 4-12 Record of Decision in 1995. |
| | CFA-02 | Landfill II | RI | X | OU 4-12 Record of Decision in 1995. |
| | CFA-03 | Landfill III | RI | X | OU 4-12 Record of Decision in 1995. |
| 4-13 | CFA-51[d] | Dry Well at north end of CFA-640 | | X | Well removed in 1996; samples indicate contamination between 1 and 2 ft below grade. |
| | CFA-52[d] | Diesel Fuel UST (CFA-730) at Bldg. CFA-613 Bunkhouse | | | Tank removed in 1996; contamination removed to 16 ft below grade and backfilled with clean soil. No pathway to ecological receptors. |

a. Stage in CERCLA process as follows: T1 = Track 1; T2 = Track 2; IA= Interim Action RI = RI/FS.

b. Sites marked with "X" were not screened out of the initial site review.

c. This site was added to the FFA/CO using the new site identification process.

d. A portion of CFA-17 was designated as CFA-47, a terphenyl hot spot. For the 1997 removal action and subsequent sampling, CFA-17 and CFA-47 were treated as one site.

**Table 7-3**. WAG 4 OUs and sites evaluated in the WAG ERA analysis.

| OU | Site Code | Site Description | Area Assessed ($m^2$) | COPCs[a] | Contaminated Media |
|---|---|---|---|---|---|
| 4-02 | CFA-13 | Dry Well (South of CFA-640) | 2.50E+01 | VOCs, PCBs, PAHs, metals, radionuclides | Subsurface soil |
| | CFA-15 | Dry Well (CFA-674) | 3.00E-01 | PAHs, metals, radionuclides | Subsurface soil |
| 4-03 | CFA-21 | Fuel Tank at Nevada Circle 1 (South by CFA-629) | 7.00E+00 | TPH, BTEX | Subsurface soil |
| | CFA-23 | Fuel Oil Tank at CFA-641 | 1.11E+01 | TPH, BTEX | Subsurface soil |
| | CFA-24 | Fuel Tank at Nevada Circle 2 (South by CFA-629) | 2.04E+01 | TPH, BTEX | Subsurface soil |
| | CFA-25 | Fuel Oil Tank at CFA-656 (north side) | 1.39E+01 | TPH, BTEX | Subsurface soil |
| | CFA-27 | Fuel Oil Tank at CFA-669 | 9.28E+00 | TPH, BTEX | Subsurface soil |
| | CFA-28 | Fuel Oil Tank at CFA-674 (West) | 8.00E+01 | TPH, BTEX, VOCs | Subsurface soil |
| | CFA-29 | Fuel Oil Tank at CFA-664 | 2.09E+01 | TPH, BTEX | Subsurface soil |
| | CFA-30 | Fuel Oil Tank at CFA-665 | 2.08E+01 | TPH, BTEX | Subsurface soil |
| | CFA-31 | Waste Oil Tank at CFA-754 | 2.52E+01 | TPH, BTEX, VOCs | Subsurface soil |
| | CFA-32 | Fuel Oil Tank at CFA-667 (North) | 2.08E+01 | TPH, BTEX | Subsurface soil |
| | CFA-34 | Diesel Tank at CFA-674 (South) | 7.43E+00 | TPH, BTEX | Subsurface soil |
| | CFA-37 | Diesel Tank at CFA-681 (South) | 5.94E+00 | TPH, BTEX | Subsurface soil |
| | CFA-38 | Fuel Oil Tank at CFA-683 | 7.56E+01 | TPH, BTEX | Subsurface soil |
| | CFA-45 | Fuel Oil Tank (CFA-605W) | 2.53E+02 | TPH, BTEX | No sample data |
| 4-04 | CFA-40 | Returnable Drum Storage—South of CFA-601 | 5.84E+02 | TPH, BTEX | No sample data |
| | CFA-41 | Excess Drum Storage (South of CFA-674) | 5.23E+03 | TPH, BTEX | No sample data |
| 4-05 | CFA-04 | Pond Near CFA-674 | 6.88E+03 | Metals, asbestos, VOCs, SVOCs, radionuclides, PCBs | Surface and subsurface soil |
| | CFA-17/47 | Fire Department Training Area, bermed and Fire Station Chemical Disposal | 1.96E+03 | VOCs, SVOCs, PCBs | Surface and subsurface soil |
| | CFA-50 | Shallow Well East of CFA-654 | 2.10E+01 | Metals | Surface soil |
| 4-06 | CFA-06 | Lead Shop (outside areas) | 2.50E+03 | Metals | Surface soil |
| | CFA-43 | Lead Storage Area | 1.53E+04 | Metals | Surface soil |
| | CFA-44 | Spray Paint Booth Drain (CFA-654) | 9.24E+00 | Metals (lead) | Surface soil |
| 4-07 | CFA-12 | Two French Drains (CFA-690) | 1.34E+01 | VOCs, SVOCs, PCBs, radionuclides | Subsurface soil |
| | CFA-48 | Chemical Washout Area South of CFA-633 | 9.29E+00 | Metals | Subsurface soil |
| 4-08 | CFA-08 | Sewage Plant (CFA-691), Septic Tank (CFA-716), and Drainfield | 1.85E+04 | VOCs, SVOCs, PCBs, metals, radionuclides | Surface and subsurface soil |
| 4-09 | CFA-10 | Transformer Yard Oil Spills | 8.08E+02 | Metals, PCBs | Surface soil |
| | CFA-26 | CFA-760 Pump Station Fuel Spill | 1.12E+02 | VOCs, SVOCs, TPH | Subsurface soil |
| 4-11 | CFA-05 | CFA Motor Pool Pond | 7.43E+03 | VOCs, PCBs, metals, radionuclides | Surface and subsurface soil |

**Table 7-3.** (continued).

| OU | Site Code | Site Description | Area Assessed ($m^2$) | COPCs[a] | Contaminated Media |
|---|---|---|---|---|---|
| 4-12 | CFA-01 | Landfill I | 4.30E+04 | Cafeteria waste, construction debris, paint solvents, asbestos, chemicals, misc. wastes | Surface and subsurface soil |
| | CFA-02 | Landfill II | 7.07E+05 | Cafeteria waste, construction debris, paint solvents, asbestos, chemicals, misc. wastes | Surface and subsurface soil |
| | CFA-03 | Landfill III | 8.76E+04 | Cafeteria waste, construction debris, paint solvents, asbestos, chemicals, misc. wastes | Surface soil |
| 4-13 | CFA-51 | Dry Well at north end of CFA-64 | 1.00E-01 | VOCs, metals, radionuclides | Subsurface soil |

a. COPC designation as follows: BTEX = benzene, toluene, ethylbenzene, xylene; PCBs = polychlorinated biphenyls; SVOCs = semi-volatile organic compounds; TPH = total petroleum hydrocarbon; VOCs = volatile organic compounds.

**CFA-03**—Landfill III is located approximately 0.8 km (0.5 mi) northwest of CFA proper and covers approximately 12 acres. After CFA-02 was closed, this landfill was opened (October 1982) to handle the same types of waste disposed in Landfill II and was operational until December 4, 1984. An expansion to Landfill III was opened in 1993 west of the original Landfill III and continued to receive the same types of waste. This area was operational until 1995. The expansion is not considered part of OU 4-12 and was therefore outside the scope of the OU 4-12 RI.

**CFA-04**—This 6,880 $m^2$ (76,444 $ft^2$) site consists of a shallow pond (CFA-674) located southeast of the termination of Nevada Street. Between 1953 and 1965, the site was used for laboratory waste disposal from calcining processes in building CFA-674. Samples collected during 1994, 1995 and 1997 activities were analyzed for inorganic constituents (including metals), organic compounds (including PCBs, VOCs, and SVOCs) and radionuclides. Data indicated that elevated levels of arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, nitrate, silver, vanadium and zinc were present in subsurface soil samples. In subsurface soil samples, the highest VOC detected was toluene (1.0 mg/kg) and Aroclor-1254 was detected at 2.8 mg/kg. All radionuclides were below EBSLs.

**CFA-05**—The 7,430 $m^2$ (82,556 $ft^2$) motor pool pond is an unlined evaporation pond, located in an abandoned borrow pit approximately 3,656 m (12,000 ft) east of the CFA Equipment Yard. The pond received wastes from the wash bay and outside sumps at the Service Station (CFA-664) from 1951 through 1985. The pond continues to collect a limited amount of runoff from spring snowmelt and rain. For the ERA, this site was evaluated as the "ditch" (including the ditch waste pile and drainpipe outlet) and the "pond" (including the main pond, center pond, etc). Data from 1989 indicated that both the "ditch" and "pond" contained high concentrations of metals.

**CFA-06**—The outside areas of the lead shop consist of a 2,529 $m^2$ (28,100 $ft^2$) yard south of Building CFA-674 used for storage of excess materials, including scrap lead and batteries. A removal action in 1996 was conducted to reduce the risk to arsenic and lead. Data from this removal action indicate that arsenic was 14.5 mg/kg and lead was 17.6 in surface soil samples, both which are above EBSLs.

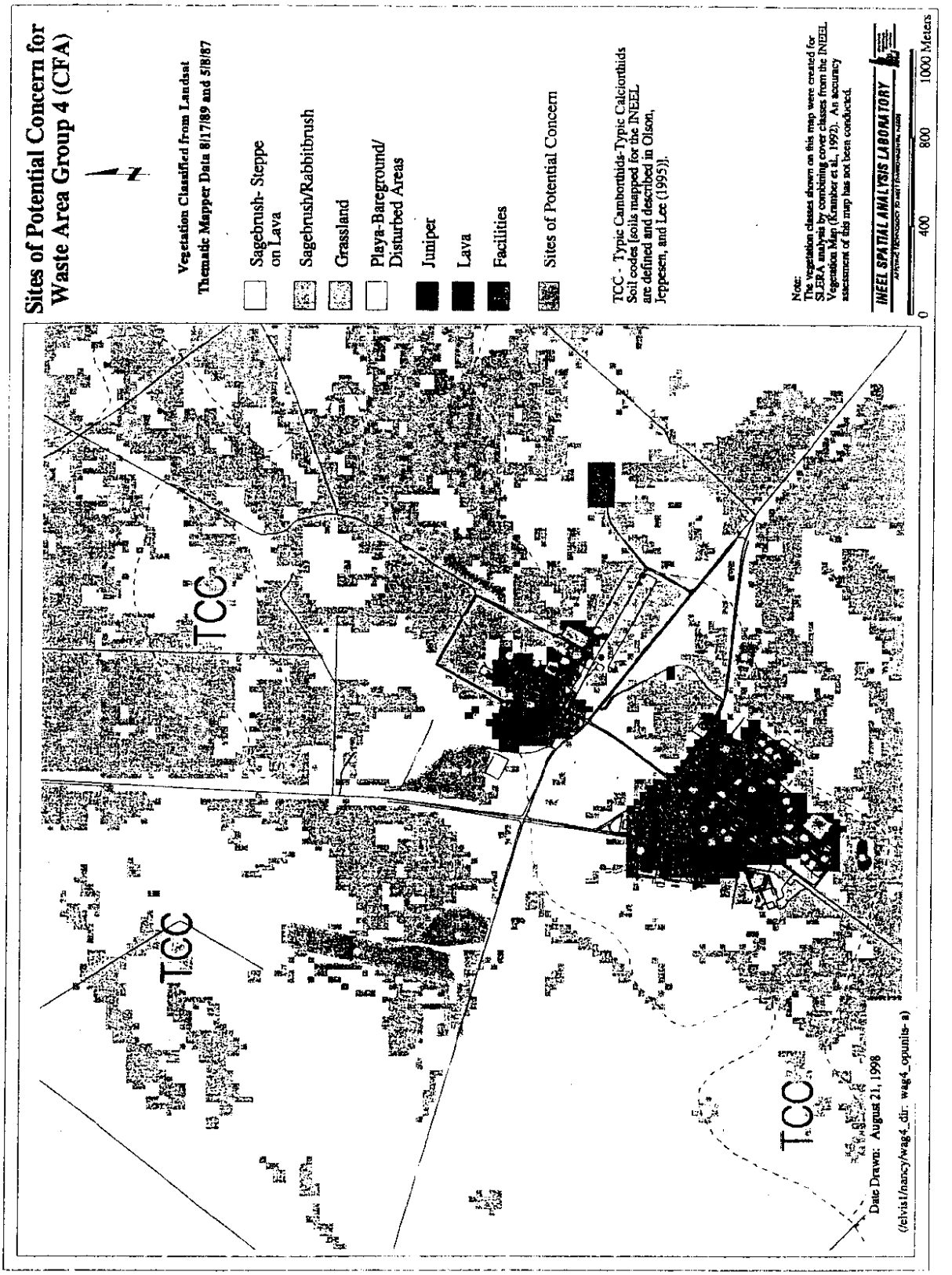


**Figure 7-2.** Sites of potential concern, vegetation and soil types in the vicinity of WAG 4.

**CFA-08**—The site consists of the 18,605 $m^2$ (200,000 $ft^2$) drainfield for the sewage treatment plant (CFA-691) and the septic tank. The drainfield is located approximately 450 m (1,476 ft) northeast of the STP and originally consisted of five distribution lines. Two of these lines were capped in 1961. Data from the 1994 and 1997 drainfield sampling indicated that elevated levels of metals and radionuclides are present in the soil.

**CFA-10**—This 808 $m^2$ (8,978 $ft^2$) transformer yard oil spill site is located southeast of Building CFA-667. The oil spills resulted from electrical transformer storage and welding shop disposal. PCBs, solvents and metals potentially contaminated the soil at this site. Only elevated levels of metals including antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel and zinc were present in surface soil samples.

**CFA-12**—This 13.4 $m^2$ (148.9 $ft^2$) site consists of two French drains located east of the north corner of Building CFA-690, which housed several laboratories and offices operated by the DOE Radiological and Environmental Sciences Laboratory. The drains were approximately 0.6 m (2 ft) in diameter and extended 1.8 m (6 ft) bgs. Data from investigations in 1995 indicated that the north drain only contained pentachlorophenol. The south drain contained elevated levels of several radionuclides, including Ag-108m, Ba-133, Cs-137, Eu-152, U-235, and U-238.

**CFA-13**—The 25 $m^2$ (277.8 $ft^2$) dry well (determined to be a sump during the 1997 removal action) is located south of the demolished locomotive repair shop Building CFA-640. This building was constructed in 1950 to provide Security and Power Management offices, a physical fitness area, a line crew craft area, an automotive repair garage, and a locomotive repair area. Data from the removal action indicate that subsurface soil (3 to 10 ft) was contaminated with elevated concentrations of PAHs, PCBs, lead and radionuclides.

**CFA-15**—The site consists of a 0.3 $m^2$ (3.33 $ft^2$) dry well located northwest of and adjacent to a laboratory building (CFA-674) at Nevada Street. A floor drain inside Building CFA-674 was connected to the dry well and therefore was potentially contaminated. Samples from the 1997 removal action were analyzed for metals, VOCs, SVOCs, inorganics, herbicides, pesticides, radionuclides, PAHs, and dioxin. Data indicated that only metals and radionuclides were present in subsurface soil (between 2 to 10 ft bgs) at the site. High concentrations of arsenic, barium, chromium III, copper, lead, manganese, mercury, nickel, silver, thallium, vanadium and zinc were detected. Moderate levels of Am-241, Ra-226, Sr-90, U-234, U-235, U-238 and Zn-65 were also detected.

**CFA-17/47**—The 1,960 $m^2$ (21,778 $ft^2$) site consists of the bermed Fire Department Training Area (originally designated CFA-17) and the Fire Station Chemical Disposal, (originally designated CFA-47) located 4 km north of CFA. The sites were combined during the RI/FS because they are adjacent and contain similar wastes. The training area consists of a leach pond and a gravel fire-training pad that was used from 1958 through 1995. The leach pond collected and contained wastes and wastewater from training exercises and consisted of unburned fuel, products of combustion and possible solvent residue. Approximately 18m (59 ft) south of the training area and outside of the berm is where the waxy terphenyls and trinitrotoluene were disposed after training activities. Various metals, SVOCs and VOCs were initially identified but only a few SVOCs and VOCs were detected at elevated levels.

**CFA-21**—The CFA-21 site consists of a 1,893-L (500-gal) UST near CFA-629 used to store diesel fuel for heating purposes. The former tank, removed in 1991, was located in a grassed area approximately 30.5 m (100 ft) west of CFA-629. During removal operations, the tank was inadvertently punctured resulting in a spill of approximately 284-L (75-gal) of diesel fuel in the excavation. Approximately 227-L (60-gal) of spilled fuel was retrieved and the remaining 56.8-L (15-gal) was

adsorbed into the soil, resulting in high concentrations (54,000 mg/kg) of TPH-diesel in soil samples collected in the excavation. BTEX were not detected in any soil samples.

**CFA-23**—The CFA-23 site consists of one 208-L (55-gal) steel UST adjacent to CFA-641, used to store diesel fuel for heating purposes. The tank was installed in 1949, abandoned in 1975, and removed in 1990. Although there was no apparent evidence of leakage at the removal site, soil samples were collected and analyzed for BTEX and TPH. Benzene, ethylbenzene, and xylene were not detected. Toluene was detected at a concentration less than the risk-based concentration. TPH was detected at a maximum concentration of 100 mg/kg.

**CFA-24**—The CFA-24 site consists of one 1,893-L (500-gal) UST east of Building CFA-629, used to store diesel fuel for heating purposes. Records indicate that the tank was installed in 1958, abandoned in 1970, and removed in May 1991. The depth of excavation was 2.3 m (7.6 ft). Prior to backfilling the tank excavation area, soil samples were collected and analyzed for BTEX and TPH. Analytical results for TPH showed a maximum concentration of 26 mg/kg and BTEX were not detected.

**CFA-25**—The CFA-25 site consists of one 1,893-L (500-gal) UST near Building CFA-656, used to store diesel fuel for heating purposes. The tank was installed in 1944, abandoned in 1960, and removed in October 1990. Prior to backfilling the tank excavation area, soil samples were collected and analyzed for BTEX and TPH. The analytical results indicate that BTEX was not detected and that TPH was detected at a maximum concentration of 20 mg/kg.

**CFA-27**—The CFA-27 site consists of one 55,775-L (15,000-gal) UST used to store diesel fuel for heating Building CFA-669. The tank was installed in 1953, abandoned in 1981, and removed in 1990. Evidence of leakage from the piping was observed during removal operations, and the contaminated soil was removed and treated. There was no evidence of leakage from the tank. Prior to back filling the tank excavation area, soil samples were collected and analyzed for BTEX and TPH. Analytical results from the soil samples indicated a maximum TPH concentration of 1,100 mg/kg. The maximum concentration of 0.001 mg/kg xylene was also detected.

**CFA-28**—The CFA-28 site consists of a 3,785-L (1,000-gal) UST used to store diesel fuel for heating purposes. The tank was installed in 1956 and used until 1968 when the contents of the tank were removed. The actual tank was removed in September 1992. Soil samples collected from the excavation were analyzed for BTEX, and TPH and using the toxicity characteristic leaching procedure (TCLP) for metals and VOCs. The primary contaminant detected was TPH with a maximum concentration of 57.4 mg/kg. BTEX and VOCs were not detected. Analytical results from the soil samples collected beneath the tank confirm the noncontaminated status of the soil. There is no contamination source at the site because the tank and soil surrounding the tank were removed, and the contaminated soil was replaced with clean fill material.

**CFA-29**—The CFA-29 site consists of a 3,785-L (1,000-gal ) UST adjacent to Building CFA-664. The tank was installed in 1951, and removed in October 1990 after failing the tank tightness test. Laboratory analysis of soil samples collected from the tank bed and analyzed for BTEX and TPH showed a maximum of 290 mg/kg TPH, while BTEX were not detected.

**CFA-30**—The CFA-30 site consists of a 3,785-L (1,000 gal) UST used for bulk storage of waste oil from CFA-665. The tank was installed in 1951, and removed in September 1989 after failing a tank tightness test. Soil contamination observed in the 2.7 m (9 ft) deep excavation was removed and treated. Laboratory analysis of soil samples collected from the tank bed showed a maximum concentration of 76 mg/kg TPH. BTEX were not detected.

**CFA-31**—The CFA-31 site consists of a 56,775-L (15,000-gal) UST used for bulk storage of waste oil. The tank was located approximately 2.7 m (9 ft) southeast of CFA-677. The tank was last used in 1985. The former tank, removed in 1990, was located 2.6 m (8.5 ft) south of building CFA-677. The site was 3.6 × 7.0 m (12 × 23 ft) or 25.2 $m^2$ (276 $ft^2$). This location was within the CFA-42 area of contamination that was remediated during the 1996 and 1997 removal actions. All contaminated soil was removed from the former tank location. Upon removal, visible areas of contamination were observed in the excavated area. Approximately 260 $m^3$ (340 $yd^3$) were removed from the excavation and replaced with clean soil. Analytical results from soil samples collected prior to backfilling the excavation with clean soil, indicated low concentrations of BTEX and a maximum concentration of 5,610 mg/kg TPH.

**CFA-32**—The CFA-32 site consists of a 681-L (180-gal) UST used to store diesel fuel for heating purposes. The tank is located near CFA-667. The tank and associated piping were removed in October 1990. No evidence of leakage from the tank or piping was observed during removal operations. BTEX were not detected, and TPH was detected at a maximum concentration of 30 mg/kg.

**CFA-34**—The CFA-34 site consists of a 984-L (260 gal) UST installed adjacent to the southwest corner of Building CFA-674. The tank, assumed to have been abandoned in 1976, was removed in October 1990. Upon excavation, several large holes were observed in the tank along with contaminated soil. The contaminated soil was removed from the excavation and soil samples were collected to determine concentrations of TPH and BTEX. Analytical results indicate a maximum TPH concentration of 290 mg/kg.

**CFA-37**—The CFA-37 site consists of a 1,893-L (500 gal) UST located on the south side of CFA-681, used to store diesel fuel for heating purposes. The tank was removed in October 1990. Stained soil at the excavation site was removed and treated. Prior to backfilling, soil samples were collected to determine contaminant concentrations. TPH was detected at a maximum concentration of 180 mg/kg. BTEX was not detected.

**CFA-38**—The CFA-38 site consists of a 1,893-L (500-gal) UST used to store diesel fuel for heating Building CFA-683. The tank was installed in approximately 1949, used until 1980, and removed in May 1992. No evidence of leakage was observed from the tank or associated piping during removal operations. Soil samples collected from the tank bed were analyzed for TPH and BTEX. The maximum TPH concentration detected was 427 mg/kg.

**CFA-40**—The CFA-40 site consists of a storage area for empty drums awaiting pickup by the product vendor. The site is located south of Building CFA-601. Qualitative screening samples were collected in May 1995 and analyzed for TPH. The results indicated that TPH concentrations were less than 625 mg/kg.

**CFA-41**—The CFA-41 site consists of an area south of Building CFA-674 which served as a storage area for empty drums prior to resale. The drums are believed to have contained used motor oil, antifreeze, or Stoddard solvent, which were rinsed prior to storage. Qualitative field screening samples were collected in May 1995 and analyzed for TPH. Screening results from two of the soil samples collected exceeded 1,000 mg/kg (the concentration capacity of the test kit). In August 1995, additional soil samples were collected for VOC analysis to further quantify and identify the areas exceeding the TPH action limit. Toluene was the only VOC detected at an estimated concentration of 0.002 mg/kg.

**CFA-43**—This site consists of a storage yard south of Building CFA-674. From 1940 to 1988, this site was used for storage of excess materials, including scrap lead and batteries. In 1988, a molten lead spill of approximately 4.5 kg (10 lb) occurred along the southwest fenced area, which may have resulted

in soil contamination. The spilled lead was allowed to harden, was raked up and recycled. The storage area has been regraded several times since 1988. Following the removal action at OU 4-06 in October 1996, the storage area was covered with a clean layer of packed gravel. The area is currently fenced and contains used office furniture and other stored nonhazardous equipment and supplies for private market sale or disposal.

**CFA-44**—The site is located adjacent to the former CFA-654 warehouse which is near to center of CFA. CFA-44 is approximately 3 × 3 m (10 × 10 ft) or 9.24 $m^2$ (100 $ft^2$). This site consists of a drain outlet from a spray booth on the east side of Building CFA-654, where various types of paints such as epoxy, latex, and enamel were used. These materials were used from 1952 to 1983. The spray booth used a water curtain system to scrub paint particles from the air before it was discharged to the atmosphere. Water was recycled through the system and reused in the water curtain. The water was treated using coagulants and flocculants to settle out the solids, which were then collected in a sump and disposed in the CFA Landfill until disposal procedures were changed and the solids were disposed as hazardous waste. Treated wastewater without solids was discharged from the booth to the drain system and then onto the ground approximately once per month. Solvents containing VOCs in the paint booth ventilation air that would have been removed by the water curtain would also have been re-entrained and emitted to the atmosphere.

**CFA-45**—The CFA-45 site consists of a 45,420-L (12,000-gal) steel UST formerly located southwest of Building CFA-605, and used to store diesel fuel. The tank was removed in 1991. Soil samples collected from the bottom of the excavation [5.9 m (19.5 ft)] were analyzed for TPH and BTEX. A maximum concentration of 9,020 mg/kg TPH was detected. Concentrations of 0.1, 0.23, 1.0 and 2.6 mg/kg were found for benzene, toluene, ethylbenzene, and xylene, respectively. A Track 2 investigation was performed as part of OU 4-09 (Gianotto et al. 1995).

**CFA-48**—Site CFA-48 was discovered and added to the FFA/CO in 1994 using a new site identification form. The site consists of an area on the southeast side of Building CFA-633 where approximately 11,355 to 18,925-L (3,000 to 5,000-gal) of water containing chemicals was ponded. The laboratory in Building CFA-633 used chemicals including perchlorates and sulfates for dissolution and extraction operations. The site was included in the FFA/CO when an employee gave anecdotal information that radiological contaminants were disposed to the area (apparently before the area was covered with asphalt and concrete). One sample was collected from a spot in the vicinity of the former disposal area after layers of asphalt and concrete were removed. In June 1995, one surface soil sample was collected 2.2 m (7 ft) east of the CFA-633 door in support of the Track 2 investigation. This sample was analyzed for metals, gamma-emitting radionuclides, and anions. For the metals, analytical results indicated that aluminum, lead, and mercury concentrations were detected above background concentrations. For the radionuclides, Cs-137 was detected at a concentration less than background.

**CFA-50**—CFA-50 was identified as a new site under the FFA/CO in 1994. The site consists of a shallow injection well located along the east side of the former location of Building CFA-654. Building CFA-654 was demolished in 1994; however, the well [approximately 3 m (10 ft) from the building foundation] was left in place. The well is believed to have received paint residues from a paint shop located in Building CFA-654. Soil samples were collected from the well in 1993 and 1994. Metals, VOCs, and several radionuclides were detected. Cs-137 was the only radionuclide detected, although it was detected at a concentration less than background. As a result, the well was removed as part of a time critical removal action in July 1995. Soil samples were collected after the well was removed to obtain adequate data to evaluate the potential risk remaining at the site. Soil samples were analyzed for VOCs and metals. Analytical results indicate that several metals were detected at concentrations slightly above background surface soil concentrations for metals at the INEEL. No VOCs were detected.

**CFA-51**—CFA-51 is the former location of a small dry well located at the north end of Building CFA-640. The dry well was located at the north end of CFA-640. The dry well and surrounding soil were removed along with the building in 1995/96. The data are from samples collected inside the dry well, which was removed and disposed. Samples were collected from the bottom of the dry well in 1996. Analytical results indicate that Aroclor-1254 is present, and that several metals are present above background concentrations.

### 7.2.3 Ecosystem Characterization

The INEEL is located in a cool desert ecosystem characterized by shrub-steppe vegetative communities typical of the northern Great Basin and Columbia Plateau region. The surface of the INEEL is relatively flat, with several prominent volcanic buttes and numerous basalt flows that provide important habitat for small and large mammals, reptiles, song and game birds, and some raptors. The shrub-steppe communities are dominated by sagebrush *(Artemisia* spp.) and provide habitat for sagebrush community species such as sage grouse *(Centrocercus urophasianus),* pronghorn *(Antilocapra americana),* and sage sparrows *(Amphispiza belli).* Other communities are comprised of rabbitbrush *(Chrysothamnus* spp.), grasses and forbs, salt desert shrubs *(Atriplex* spp.), and exotic or weed species. Juniper woodlands occur near the buttes and in the northwest portion of the INEEL, these woodlands provide important habitat for raptors and large mammals. Limited riparian communities exist along intermittently flowing waters of the Big Lost River and Birch Creek drainages.

WAG 4, which is comprised of hazardous waste release sites at CFA (see Figure 7-2), is located in the north-central portion of the INEEL (refer to Figure 1-1). CFA is an administrative facility with most land surfaces covered by landscaping, facilities and pavement with areas of natural vegetation, disturbed communities, and bare ground. Natural communities are also found around the perimeter of WAG 4. Areas outside the WAG 4 fenced boundary include sagebrush/rabbitbrush shrub-steppe, sagebrush-steppe on lava, and grasslands. These components are discussed in detail in the following sections.

### 7.2.4 Abiotic Components

CFA is located on the alluvial plain on the Big Lost River. The topography of the assessment area is relatively flat. The area is comprised of Typic Camborthids-Typic Calciorthids (TCC) soils (see Figure 7-2).

The TCC soils are alluvium, which is deposited by the Big Lost River. TCC soils are older than some of the other soil types and are further from the river. TCC soils are loams or silt loams over gravelly or sandy loams, and the surface is frequently hardened due to the alkaline conditions. Generally, TCC soils are not as fine as, nor found on the surface as, some of the other INEEL soil types. This soil type is often dry and generally alkaline and saline, impermeable, erodible, and has little organic accumulation in the upper layer (USDA 1975, 1980). Spring thaws and intense rainstorms may lead to significant soil erosion.

Root uptake of contaminants is a complex process that depends on various soil properties such as pH, cation-exchange capacity, and organic matter content. In addition, the process is highly variable from one plant species to another. While soil-plant relationships are not specifically considered as part of the WAG 4 ERA, this information is presented to support possible comprehensive analyses.

The climate at WAG 4 cannot be differentiated from that of the entire INEEL because meteorological data that are ultimately reported are collected in only two locations on the INEEL. Data reported here are collected at the CFA National Oceanic and Atmospheric Administration meteorological station. The average annual temperature is 5.4°C (41.7°F) with a mean annual precipitation of 22.2 cm

(8.74 in). Annual snowfall ranges from a low of about 30 cm (12 in.) to a high of about 102 cm (40 in.) and averages 66 cm (26 in.). Wind patterns at the assessment area are from the west-southwest or southwest approximately 40 percent of the time, and the average speed is 15.0 kph (9.3 mph) at 6.1 m (20 ft.). Wind direction the remaining 60 percent of the time is a combination of directions, predominantly due west or northwest.

Major stream flows that reach the INEEL terminate at the Big Lost River playas and sinks or the Birch Creek playa, in which most water is lost to evaporation and infiltration. Surface water flow and accumulation are generally limited to spring runoff and intense precipitation events within the INEEL site boundaries, and no major natural drainages occur at the CFA or nearby areas surrounding the facilities. Surface flow is limited to localized runoff, particularly from the parking lot and driveways of the existing facilities within WAG 4. No surface hydrology exists to support fish. Surface water impoundments at the CFA support aquatic vertebrate and invertebrate species (Cieminski 1993), however, none of these impoundments are included in the scope of current CERCLA activities at WAG 4. Consequently, the surface water pathway and aquatic receptors were not evaluated in this assessment. Groundwater is present; however, for this assessment, it is assumed that no pathways to surface ecological receptors exist for these sites.

### 7.2.5 Biotic Components

Wildlife species present in and around the CFA include birds, mammals, and reptiles that are associated with facilities, sagebrush-rabbitbrush, grasslands, and disturbed habitats, deciduous trees and shrubs, and water (e.g., facility ponds and drainage areas). Both aquatic and terrestrial species are potentially present. Sagebrush habitats in areas adjacent to facilities support a number of species including sage grouse and pronghorn (important game species) and areas of grassland provide habitat for species such as the western meadowlark *(Sturnella neglecta)* and mule deer *(Odocoileus hemionus)*, also a game species. Buildings, lawns and ornamental vegetation, and disposal/drainage ponds at WAG 4 are also utilized by a number of species such as waterfowl, raptors, rabbits, mule deer and bats. No areas of critical habitat as defined in the Code of Federal Regulations (40 CFR Part 300) are known to exist in or around CFA.

The flora and fauna existing around the CFA facility are representative of those found across the INEEL (Arthur et al. 1984; Reynolds et al. 1986) and are described in the following sections. Flora surrounding CFA was determined using a vegetation map constructed for the INEEL using LANDSAT imagery and field measurements from vegetation plots (Kramber et al. 1992). Fauna potentially existing in the vicinity of CFA was identified primarily from a 1986 vertebrate survey performed on the INEEL (Reynolds et al. 1986) and from data collected subsequent to the survey. While the flora and fauna present at CFA have not been verified with a comprehensive field survey, information presented here is supported by previous field surveys and observations as described in Appendix E.

***7.2.5.1 Flora.*** The 15 INEEL vegetation cover classes defined using LANDSAT imagery data (Kramber et al. 1992) have been combined into eight cover classes for the WAGs (VanHorn et al. 1995). The vegetation surrounding CFA (shown on Figure 7-2) represents 5 vegetation cover classes, including sagebrush-steppe on lava, sagebrush-rabbitbrush, grassland, playa-bareground/disturbed areas, and juniper. A sixth cover class, lava, is shown in an area in which a stockpile of dark colored aggregate with the same spectral signature as that of lava or basalt. The species composition for each of these classes summarized on Table 7-4. Sagebrush/rabbitbrush is the predominant vegetation type. The dominant vegetation species within this community are the Wyoming big sagebrush *(Artemisia tridentata* spp. *wyomingensis)* and green rabbitbrush *(Chrysothamnus viscidiflorus)*. Grasslands present in the area consist primarily of wheatgrasses *(Agropyron* spp. and *Elymus* spp). The playa-bareground/disturbed cover class primarily represents areas associated with disturbances in and around WAG 4. Two isolated

**Table 7-4.** Vegetation cover class summary for areas in and surrounding WAG 4.

| WAG ERA Vegetation Cover Class | INEEL Vegetation Cover Classes | Dominant Species |
|---|---|---|
| Grasslands | Steppe<br>Basin Wildrye<br>Grassland | *Leymus cinereus*<br>*Descurainia sophia*<br>*Sisymbrium altissimum*<br>*Elymus lanceolatus*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Elymus elymoides*<br>*Chrysothamnus viscidiflorus* |
| Sagebrush/Rabbitbrush | Sagebrush-steppe off lava<br>Sagebrush-winterfat<br>Sagebrush-rabbitbrush | *Artemisia tridentata* ssp. *wyomingensis*<br>*Chrysothamnus viscidiflorus*<br>*Bromus tectorum*<br>*Sisymbrium altissimum*<br>*Achnatherum hymenoides* |
| Salt desert shrubs | Salt desert shrub | *Atriplex nuttallii*<br>*Atriplex canescens*<br>*Atriplex confertifolia*<br>*Krascheninnikovia lanata* |
| Sagebrush-steppe on lava | Sagebrush-steppe on lava | *Artemisia tridentata* ssp. *wyomingensis*<br>*Achnatherum hymenoides*<br>*Chrysothamnus viscidiflorus* |
| Playa-bareground/disturbed areas | Playa-bareground/gravel borrow pits, old fields, disturbed areas, seedings | *Kochia scoparia*<br>*Salsola kali*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Chrysothamnus viscidiflorus* |

areas of juniper shown on the figure have not been verified. These areas may represent other vegetation or structures having characteristics that result in the same spectural signature as juniper.

Areas of facility ornamental vegetation, (not represented on Figure 7-2), include lawns and deciduous trees and shrubs. Common bird species such as the American robin (*Turdus migratorus*) and house finch (*Carpodacus mexicanus*) and mammals including Nuttall's cottontail (*Sylvilagus nuttallii*) and the montane vole (*Microtus montanus*) utilize this vegetation. These areas also provide habitat for less common species such as the song sparrow (*Melospiza melodia*) and Bohemian waxwing (*Bombycilla garrulus*). These areas may draw particular species to areas of potential exposure or contamination that otherwise would not be present at CFA.

***7.2.5.2 Fauna.*** A comprehensive list of fauna potentially present at and surrounding WAG 4 is presented in Appendix H. The list incorporates the concept of functional grouping as described in the Guidance Manual (VanHorn et al. 1995). The functional grouping approach is designed to group similar species to aid in analyzing the effects of stressors on INEEL ecosystem components. The primary purpose for functional grouping is to apply existing data from one or more species within the group to assess the risk to the group as a whole. Functional groups are used to perform a limited evaluation of exposures for all potential receptors and provide a mechanism for focusing subsequent analyses on receptors that best characterize potential contaminant effects.

Functional groups designed to be representative of receptors at WAG 4 have been identified from those listed in Appendix F. The functional groups evaluated in the WAG 4 ERA were selected with the assumption that those groups would be conservative indicators of effect for other similar groups. Species

characteristics including trophic level, breeding, and feeding locations were used to construct functional groups for INEEL species. Individual groups were assigned a unique identifier consisting of a one- or two-letter code to indicate taxon (A = amphibians, AV = birds, M = mammals, R = reptiles, I = insects), and a three-digit code derived from the combination of trophic category and feeding habitats. For example, AV122 represents the group of seed-eating (herbivorous) bird species whose feeding habitat is the terrestrial surface and/or understory. The trophic categories (first digit in three-digit code) are as follows: 1 = herbivore, 2 = insectivore, 3 = carnivore, 4 = omnivore, and 5 = detrivore. The feeding habitat codes (second and third digits in three-digit code) are derived as follows:

- 1.0 Air
- 2.0 Terrestrial
  - 2.1 Vegetation canopy
  - 2.2 Surface/understory
  - 2.3 Subsurface
  - 2.4 Vertical habitat (man-made structures, cliffs, etc.)
- 3.0 Terrestrial/Aquatic Interface
  - 3.1 Vegetation canopy
  - 3.2 Surface/understory
  - 3.3 Subsurface
  - 3.4 Vertical habitat
- 4.0 Aquatic
  - 4.1 Surface water
  - 4.2 Water column
  - 4.3 Bottom

The list of species potentially present in the vicinity of WAG 4 was developed by updating 1986 data on the relative abundance, habitat use, and seasonal presence of fish, amphibians, reptiles, birds, and mammals recorded on the INEEL (Reynolds et al. 1986) and by communicating with INEEL researchers and personnel conducting ecological studies since 1986. Fauna that are not supported by the existing habitat or that are rare or uncommon or otherwise unlikely to be found in the CFA vicinity were not included in the literature search for species specific exposure and/or toxicity data. Those species are also listed in Appendix F.

Use of the CFA ponds by wildlife has not been formally documented and the frequency of use by wildlife is unknown. Ponds in and around other facilities are known to be frequented by waterfowl, including ducks, geese, mergansers, coots and scaup; shorebirds, including avocet, sandpipers, killdeer, willet, phalarope, and grebe; swallows; and passerines including blackbirds, sparrows, starlings, horned lark, and doves; and, to a limited extent, by raptors such as kestrel, ferruginous hawk, and northern harrier (Cieminski 1993). Mammals have also been observed at the disposal ponds despite the perimeter fencing. Species observed include small mammals, coyote, mule deer and pronghorn (Cieminski 1993).

Species potentially present at and surrounding WAG 4 represent all 23 INEEL avian functional groups and nine of 10 mammalian functional groups. Both reptilian functional groups are represented by species inhabiting the immediate area. No amphibians are known to be present and no surface hydrology exists to support fish. Aquatic invertebrates, however, are supported by habitat provided by facility disposal and drainage ponds (Cieminski 1993).

Both aquatic and terrestrial invertebrates and microorganisms are present at CFA. Invertebrates are important links in dietary exposure for wildlife, and also may function as good indicators for contaminant exposure in soil, aquatic systems, and vegetation uptake, and microorganisms also play an important role in ecosystem processes. A list of terrestrial invertebrates potentially present in and surrounding CFA is not currently available and these ecosystem components are not quantitatively assessed in the WAG 4 ERA.

Although some population studies have been conducted for cyclic rabbit and rodent populations and several game species (e.g., pronghorn, sage grouse, and raptors), no recent comprehensive studies have been conducted to assess either WAG-specific or INEEL-wide wildlife population status and trends associated with contaminant effects.

Wildlife species present in and around CFA include birds, mammals, and reptiles that are associated with facilities, lawns, ornamental trees and shrubs, sagebrush/rabbitbrush and grassland habitats, grasslands, disturbed areas and water (e.g., facility ponds and drainage areas). Both aquatic and terrestrial species are potentially present. The varying behaviors of these species include, but are not limited to, grazing and browsing on vegetation, burrowing and flying, and preying on insects and small mammals. The complexity of these behaviors is significant when considering the fate and transport of contaminants and the possibility of exposure to contaminants. Subsurface contamination can become surface contamination when translocated by burrowing animals, or can be introduced into the food web when plants uptake contamination and are then ingested by an herbivore. If prey, such as a small mammal, becomes contaminated by ingesting contaminated soil or vegetation, and is then captured by a predator, such as a ferruginous hawk, the contamination can be taken offsite when the hawk returns to its nest to feed nestlings. Scenarios for potential exposure of fauna to WAG 4 contaminants are discussed in Section 7.3.

The flora and fauna potentially present within WAG 4 are combined into a simplified food web model as presented on Figure 7-3. Variability in environmental conditions, such as population sizes or seasons, is not considered in this model, and a constant environment is assumed. Because both aquatic and terrestrial habitats are present, the model incorporates both terrestrial and aquatic species. However, only terrestrial linkages have been evaluated for this ERA. Depicted are the decomposers, producers (vegetation), primary consumers or herbivores (e.g., rodents), secondary consumers or carnivores (e.g., snakes), and tertiary or top carnivores (e.g., raptors) and the dietary relationships between each level. These relationships were incorporated to identify direct and indirect exposure to contaminants for the conceptual site model as discussed in Section 7.2.9. This model depicts the possible transport of WAG 4 contaminants through the food web.

***7.2.5.3 Threatened, Endangered, and Other Species of Concern.*** A list of T/E and sensitive species was compiled from the U.S. Fish and Wildlife Service (USFWS) (letter dated July 16, 1997), the Idaho Department of Fish and Game Conservation Data Center threatened, endangered, and sensitive species for the State of Idaho (CDC 1994); and RESL documentation for the INEEL (Reynolds et al. 1986). T/E or sensitive species that may be found on the INEEL are listed in Table 7-5. Those species with a potential presence at WAG 4 are listed in bold text in the table. The USFWS no longer maintains a candidate species (C2) listing but addresses former C2 species as "species of concern" (USFWS 1996). The C2 designation is retained here to maintain consistency with INEEL ERAs conducted prior to the change in USFWS listing procedures.

No areas of critical habitat, as defined in the Code of Federal Regulations (CFR) (CFR 300 40), are known to exist in, at or near WAG 4. At the time the WAG 4 SLERA was conducted, Oxytheca *(Oxytheca dendroidea)* was listed as a sensitive plant species with the U.S. Bureau of Land Management (BLM) and the Idaho Native Plant Society (INPS)/Idaho Fish and Game Conservation Data Center. This

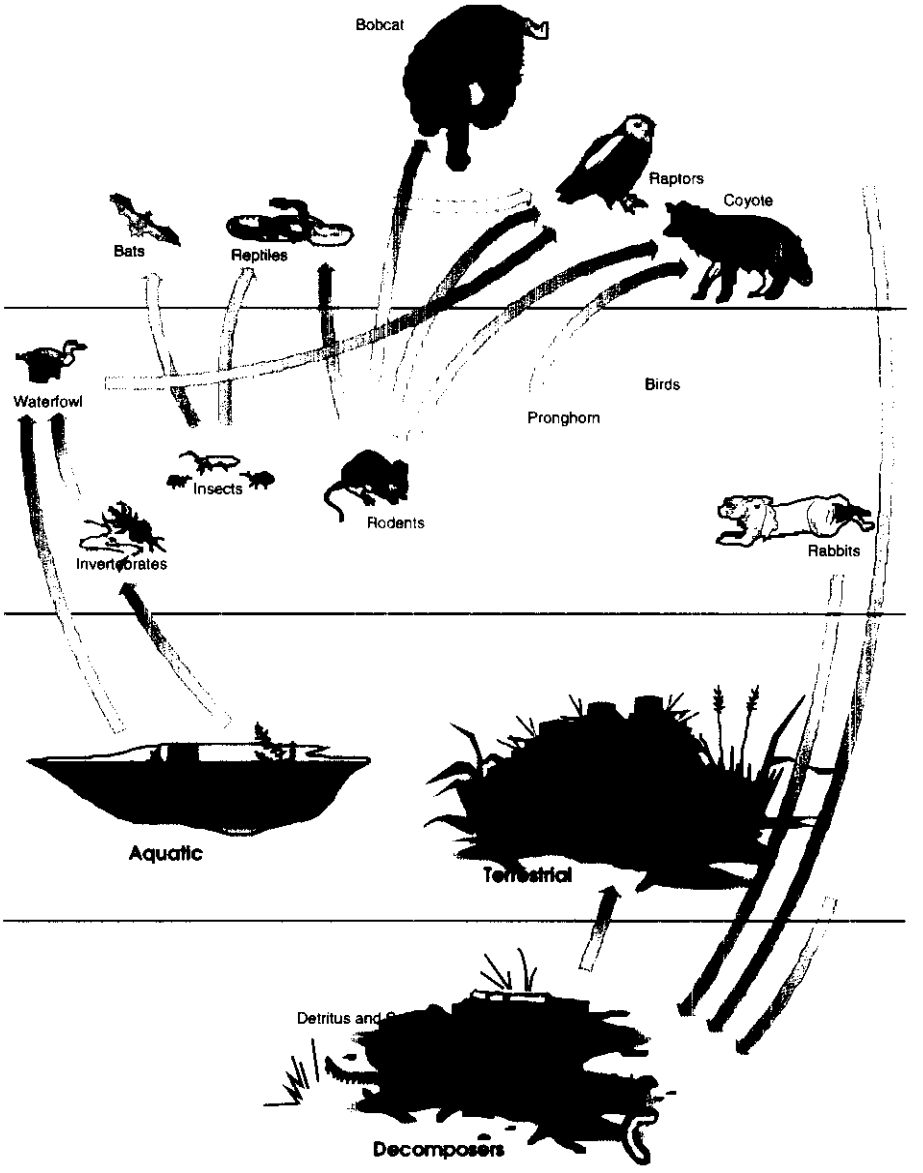


**Figure 7-3.** Food web for WAG 4

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**Figure 7-3.** Food web for fauna at WAG 4.